American Potato Journal

Published Monthly by

THE POTATO ASSOCIATION OF AMERICA

East Lansing, Michigan

VOLUME VII MAY, 1930 NUMBER 5

C-O-N-T-E-N-T-S

	Page
The Cost of Producing Potatoes in Pennsylvania EARLE L. MOFFITT	123
Potato Seed Treatment in New York State F. M. BLODGETT	130
The Michigan Potato Growers' Response to Price IRVIN HOLMES	136
Degeneration of Potatoes in Connecticut B. A. BROWN	140
Editorial and Membership Committees Potato Association of America, 1930	142
Notes	145
Review of Recent Literature	149

Entered as second class matter at East Lansing, Michigan, March 4, 1928, under Act of March 3, 1879

Accpted for mailing at special rate of postage provided for in section 412, Act of February 28, 1925, authorized on March 14, 1928.

SUBSCRIPTION PRICE $1.00 PER YEAR

AMERICAN POTATO JOURNAL

PUBLISHED BY

THE POTATO ASSOCIATION OF AMERICA

EAST LANSING, MICHIGAN

The Cost of Producing Potatoes in Pennsylvania

EARLE L. MOFFITT, State College, Pa.

The November crop estimates of the United States Department of Agriculture says that there were grown in this country this year 3,371,429 acres of potatoes, yielding 354,000,000 bushels. Of these, Pennsylvania grew 241,000 acres, yielding 26,269,000 bushels. This is 7.1 per cent of the acreage and 7.4 per cent of the yield.

Ordinarily Pennsylvania is not looked upon as being much of an agricultural state, especially by those not living within her borders. However, when we study comparative statistics we find a rather different condition to be true as is shown by the above figures. This places Pennsylvania as the second largest potato producing state this year, being exceeded only by the state of Maine. The condition this year is not very unusual, because for the last 12 to 15 years Pennsylvania has ranked at varying positions among the first five potato producing states of the Union.

Since 1918 the trend of acreage of potatoes in Pennsylvania has been downward. In 1918, there were grown 275,000 acres. This acreage gradually decreased to only 198,000 in 1926, and has increased since that time to 241,000 this year. In contrast to this we find that total production has tended to move upward. In 1918, only 22,000,000 bushels were produced, and in 1928 our total production was 31,980,000 bushels, or an increase over the period of 12 years of 45 per cent. This increase in total production while acreage was decreasing was accomplished by an increase in acre yields. In 1918, the average yield per acre was 80 bushels. This acre yield grad-

ually increased until 1928 when it reached its peak at 130 bushels per acre and then decreased to 109 bushels this year.

Pennsylvania has a total consuming population of nine and one-half millions of people and consumes approximately thirty-three and one quarter million bushels of potatoes per year, based on a consumption of three and one-half bushels per capita. Of this total consumed we furnished from within the state only about 50 per cent, because during the past year we produced 26 millions, of which about 5 million bushels are needed to plant next year's crop and allowing for shrinkage and unmarketable potatoes leaves only about 17 million bushels for consumption. This state then furnishes a good market for about 17 million bushels of potatoes that are grown in other states.

This fact of other potatoes coming in to be sold in competition with the home grown product has caused considerable interest in cost of producing the crop. The farmers of the state are realizing that if they do not wish to have their market for potatoes taken away from them they must produce a better product, put up in a better way, at a lower cost, in order to successfully meet this outside competition.

Farmers of this state have the advantage of the transportation rate from other states, but this advantage in many cases is completely wiped out by higher priced land, taxes, large applications of fertilizer, and often high labor charges that must be paid to compete with adjacent industrial demands.

Request for cost of potato production information became so insistent as far back as 1921 that a special blank was prepared for recording the costs in growing the crop. These blanks were distributed among the interested farmers in all sections of the state. At the close of the growing season then, they were sent in to the central office at the College to be summarized. This work has been kept up continously from then until 1929. It was just about this time that spraying potatoes for disease and insect control was receiving considerable attention, and in many cases remarkable differences in yield were noted between sprayed and unsprayed potatoes. So at the same time tabulations were made to show these differences in yield and to determine the added costs of the spraying operation.

The following table gives briefly the summary of these costs from 1921 to 1929 inclusive

The following is a brief summary compared with the average costs for the eight preceding years:

	1929	1928	1927	1926	1925	1924	1923	1922	1921
Total No. of Acres	270.16	570.97	317.1	271.0	312.7	236.25	36.5	466.3	619.3
Average Yield Per Acre	258.2 Bu.	295. Bu.	276.8 Bu.	252. Bu.	211. Bu.	239. Bu.	193. Bu.	196. Bu.	169. Bu.
Average Cost per Acre	$151.03	$155.16	$156.44	$158.85	$113.15	$126.89	$117.28	$113.07	$104.77
Average Cost per Bushel	.584	.52	.56	.63	.531	.53	.61	.58	.62
Total No. Acres Sprayed	276.16	502.97	297.1	186.8	252.	146.	28.5	376.1	384.6
Average No. Times Sprayed	11.88	11.67	10.2	8.3	6.7	6.7	8.0	6.8	5.9
Yield per Acre Sprayed	260. Bu.	303. Bu.	283. Bu.	282. Bu.	231. Bu.	252. Bu.	225. Bu.	205. Bu.	176. Bu.
Yield per Acre Unsprayed	91.4 Bu.	233. Bu.	162. Bu	186. Bu.	127. Bu.	218. Bu.	82. Bu.	153. Bu.	145. Bu.
Cost Spraying One Acre Once	$1.76	$1.39	$1.53	$1.56	$1.56	$1.63	$2.14	$1.52	$1.87
Cost Spraying One Acre Entire Season	$20.93	$16.22	$15.63	$12.93	$10.39	$10.90	$17.04	$10.34	$11.03

This summary shows that the costs per acre were $104.77 in 1921, gradually increasing to $158.85 in 1926, and since that there has been a reduction each year to $151.03 in 1929.

Costs per bushel have tended to decrease each year as the acre costs increased. This is due to the fact that average yields per acre have increased from 169 bushels in 1921 to the highest yield, 295 bushels, in 1928.

When we look at the yield of the sprayed acres in comparison with the unsprayed, we find that there was a very marked difference each year. The average difference for the period was 91.3 bushels.

The cost of spraying one acre once varied from $1.39 in 1928 to $2.14 in 1923, and for spraying one acre for the entire season from $10.34 in 1922 to $20.93 in 1929. When we take the differences in yields of sprayed and unsprayed for the period, we find that there were only two years when the increase in yield could not have been sold for considerable less than 25 cents per bushel to pay the cost of spraying the acre for the season. In those two years the increase would have had to be sold for 32 and 36 cents. These figures disprove the argument often heard, that,"one cannot afford the equipment and expense in doing a good job of spraying". Where a real good job of spraying is done, the operation will pay all expenses and for the investment in the equipment in a very few years. Many farmers have found it to be paid for in one year even at ordinary prices for potatoes.

This cost of spraying includes only labor and materials, and the following brief summary gives the costs of spraying one acre once in 1929:

Man labor (1.34 hours)	$ .40
Horse labor (2.12 hours)	.32
Spray materials	1.04
Total cost	$1.76

This next table gives an itemized statement of the costs that enter into the production of an acre of potatoes, taken from the 1929 summary:

Cost of seed (24.44 bushels)	$ 27.17
Cost of fertilizer (978.3 pounds)	15.79
Cost of manure (5.75 tons)	6.18
Cash expense	18.22
Interest and depreciation	27.31
Man labor (119.9 hours)	25.97
Horse labor (95.8 hours)	14.40
Tractor labor (6.5 hours)	5.54
Miscellaneous expense	.45
Total Cost	$151.03

In figuring these costs, man labor was charged at 30 cents per hour and horse labor at 15 cents per hour. This may by some be considered too low, but it has been felt that this is farm labor that works regularly throughout the year and represents really pretty good wages when considered on the basis of a monthly charge.

There are a number of factors that influence the cost of producing a bushel of potatoes. Acre costs do not vary very much with the yield in bushels, hence anything that will influence the yield per acre will influence the costs per bushel. The factors that effect the yield, that are within the control of the farmer are, organic content of the soil, freedom from disease of the seed, storage of seed, kind and quantity of fertilizer, prepartion of seed-bed, distance between rows and in the row, depth of planting, cultural methods, freedom from weeds and grass, protection from disease and insect pests, the use of modern and efficient equipment and the use of labor saving devices such as an efficient potato seed cutter, etc.

It is not our purpose in this article to go into detail in discussion of these various factors except to cite a few outstanding cases. It has long been recognized that a crop cannot yield what it should when it is started out with the handicap of having diseased seed. Demonstrations that have been run in this state over a period of 12 years where checks were run each year, show that where disease free seed are used and cared for through the growing season exactly as the other seed is cared for, the disease free seed have outyielded the other seed by an average of 53.6 bushels. So if no other good practice is used except to plant good seed we can look for an increased yield.

Spraying for disease and insect control is a very profitable practice when done properly. It, however, is not sufficient just to spray potatoes. Proper spraying should start at the right time and be carried on at regular intervals throughout the growing season except where emergencies make it advisable to decrease the interval. The spray should be properly prepared to start with, using the right kind of lime, slaked properly, mixed with the bluestone according to exact directions, and applied with the proper pressure. If all these things are not followed carefully the best results will not be obtained. It has been found from demonstrations carried on for 12 years, where check areas were left, that sprayed acres yielded 84.5 bushels more per acre than did unsprayed acres. This is an increase of 49.7 per cent. This increase was not secured from areas where the men were not accustomed to this type of work and spraying for the first time when a big increase should be expected, but the above results were from acreages grown by

experienced growers accustomed to doing things in the right way. In 1929, demonstrations in newer areas showed an increase by spraying of only 67.7 bushels per acre, while those demonstrations run with experienced men showed an increase of 148 bushels per acre.

To illustrate how necessary it is that things be done correctly or according to directions, a summary was made last year of all crops that produced over 400 bushels per acre. Instructions have been given that the pressure in the spray tank should be 300 pounds or more at all times. When the tabulations were made the following was found to be true:

Yields from 400 to 500 bushels	290 av. lbs. pressure
Yields from 500 to 600 bushels	336 av. lbs. pressure
Yields of 600 bushels or over	374 av. lbs. pressure

This shows that the pressure with which the spray is applied does have a considerable influence on the yield. It is very profitable to watch the pressure at all times and make an effort to keep it up to at least 300 pounds. While the above figures show that the larger yields were secured with higher pressure, it does not follow that a high pressure will give a high yield. These farmers are probably the better class of potato farmers and since they are they are paying some attention to maintaining a high pressure at all times.

It has been noted that acre costs rose over the period of years included in the summary. There probably have been a number of contributing factors to this condition. When the work started farmers were using around fifteen bushels of seed per acre. This has gradually increased until this year when the average quantity used was 24.44 bushels. Seed potatoes have also increased in price because of the better quality being used.

All kinds of potato machinery have increased in price as they have become larger, stronger, and more efficient, and also farmers are using more machinery than they used to. They grow the crop largely with machinery now, where they formerly made use of more hand labor.

More fertilizer and manure are being applied than formerly. In studying the records over a period of years, it has been found that there was a tendency for several years to keep on increasing the quantity of fertilizer until large quantities were used, but this practice has swung back and now for the last five years the quantity has centered in the neighborhood of 1,000 pounds.

In the last two or three years more attention has been given

to the grading of the crop. Where this is done, it has added an extra labor cost which has increased the cost per acre.

It has been shown before that acre yields are largely the determining factor in bushel costs, and the control of yield per acre lies largely within the control of the producer. We do not suggest that producers go to any length possible to increase costs because the acre costs may be built up to the point where the crop would not be a profitable one. We do suggest, however, that yields per acre could be increased considerably by the use of the very best production methods known, with a consequent lowering of costs per bushel. Until acre yields have been increased very much more than they have been in this state, it will be found that there is only a small proportionate acre cost with the increase in yields.

In 1927, there were 43 complete cost records turned in and of these there were 16 that had yields of over 300 bushels per acre, averaging 378. These records were summarized separately and compared with the average of all the records. The average cost for all the records was $156.45, and for the 16 high yielding farms the acre cost was $176.04. The average yield per acre for all farms was 276.8 bushels, and on the 16 farms 378. The average cost per bushel on all farms was 56 cents, and on the 16 farms was 46.5 cents. Thus we see that the increase of 100 bushels caused an added cost per acre of only $19.59 and resulted in a decreased cost per bushel on the entire crop of 9.5 cents.

It was with the idea of showing that higher yields of potatoes could be produced profitably in Pennsylvania that Dr. E. L. Nixon, Extension Specialist in Plant Pathology, in 1922, introduced what was called "Pensylvania 400 Bushel Potato Club."

The following table shows the results in membership and yields of members in that club:

Year	Number Members	Number Producing Over 500 Bushels	Number Producing Over 600 Bushels
1922	14	0	0
1923	54	5	0
1924	33	1	0
1925	39	4	0
1926	97	18	2
1927	187	30	6
1928	337	76	10
*1929	71	7	2

*Records to date.

The following table is given to show that these high yields are not just the result of a special preparation for that particular year but that many members repeat year after year:

Number of men repeating successively 2 times	101
Number of men repeating successively 3 times	26
Number of men repeating successively 4 times	14
Number of men repeating successively 5 times	3
Number of men repeating successively 6 times	0
Number of men repeating successively 7 times	2

The two men repeating seven times have not failed to make membership in the club since it started.

Potato Seed Treatment in New York State

F. M. BLODGETT
Cornell University, Ithaca, N. Y.

In the treatment of seed potatoes in New York, the corrosive sublimate method has been the one most commonly used up to the present time. A modification of the standard cold method in which the treatment is made at a temperature of 126°F. for three to four minutes has been widely adopted. In 1928 about 100,000 bushels and in 1929 about 150,000 bushels were treated in this way, mostly at portable treating plants operated under the auspices of the Farm Bureaus in the different counties.

Since the publication in a previous number of this Journal (January, 1928) of a preliminary paper on the use of calomel as a dip treatment, laboratory and field tests have been continued comparing the hot or cold corrosive sublimate treatment with a calomel dip and various organic mercury dip treatments. During the past season a few tests also have been made with another material, the yellow oxide of mercury.

In laboratory tests, it becomes apparent at once that none of the dip treatments so far tried (including various organic mercury dip treatments) kills the funguous sclerotia during the process of treatment. When planted either in agar or soil the fungus is more or less inhibited from growing by the spread of the adhering chemical in the surrounding medium. Beside being able to prevent the growth of the Rhizoctonia fungus, a material for dip treatment should be relatively inexpensive, should go into suspension readily, should be easily applied, and should not injure the potatoes.

Calomel can be said to meet these requirements moderately well. It is only very slightly soluble (about .00031 parts in

100 of water) and this limits its toxicity to fungi and also to potatoes. When potatoes were treated with calomel 1-100 by weight (1 lb. to 12 gals.) and sclerotia from these potatoes planted on agar, the Rhizoctonia fungus is inhibited from growing on the surface of the agar in a zone around the sclerotia. But finally a considerable percentage (about 20%) succeed in escaping from this zone. A smaller percentage escape if the sclerotia are covered by agar. Calomel appears to be superior to Semesan Bel at the concentrations recommended when compared in such tests. No danger of injuring seed tubers with calomel has been found. Even on cut seed it seems not to hinder the corking-over process.

While the calomel is fairly expensive ($2.15 and up per pound) when diluted at the rate of 1 to 100 it compares favorably in cost with materials that can not be diluted so much. The calomel used in these tests was obtained under the trade name "Calogreen" from the Mallinckrodt Chemical Works.

Calomel is readily mixed with water but settles rather quickly so that repeated stirring is necessary to keep it in suspension. Laboratory tests indicate that a material slightly more soluble and thus more toxic, and which would stay in suspension better would be more desirable.

In seeking to meet these requirements more fully, another compound of mercury has been tried during the past season. This was a technical grade of the yellow oxide of mercury. It is available in a finely ground condition as prepared for use in paints for ships' bottoms and thus it stays in suspension considerably better than the grades of calomel so far found. The yellow oxide is also more soluble than calomel (.00515 parts in 100 parts water) and much more effective in preventing growth of Rhizoctonia sclerotia in laboratory tests. In a limited number of tests, mixtures of 1 to 100 and 1 to 200 were effective in preventing growth and 1 to 300 was fairly effective. It was included in field experiments in 1929 and used in mixtures at the rate 1 to 100 (1 lb. to 12 gals.). The technical grade which was used was obtained from Chas. Pfizer and Company, New York, and costs slightly more per pound than calomel.

Yellow oxide of mercury and calomel were used in 1929 in comparison with the standard corrosive sublimate treatments, and calomel was included also in tests in 1927 and 1928. However, during these years the losses from Rhizoctonia apparently have not been as large as normal. When all the data for corrosive sublimate seed treatment in New York State from 1918 to 1929 that I have found available, a total of 366 comparisons, are averaged, there is an average gain from this treatment of 17.14 bushels per acre with a standard error of 1.94. This indicates that the chances are 20 to 1 that this is within about four bushels per acre of the average that would be found if this

testing were continued indefinitely. There was, however, evidence of great variability from year to year and from place to place indicating that the amount of injury from Rhizoctonia, and thus gain in yield from seed treatment, is dependent on weather or local conditions that varied greatly. With the above figures in mind the results of field experiments for the current year can be examined without getting a false idea of the value of seed treatment of potatoes in general.

During 1929 no consistent difference in stand of potatoes was found between treated and untreated seed, apparently because conditions after planting were not favorable for this type of injury. In a few fields, 25 plants were dug in each plot at the time of early summer inspection with the primary object of checking on the amount of Rhizoctonia injury to the stems of the plants. Very little injury of that kind was found in most cases but some interesting observations were made of the effect of seed treatment on the rapidity of seed piece decay. In few of these cases had the seed piece decayed early enough to prevent the plant from getting started but in some seasons when conditions are not as favorable for growth, it seems possible that the stand of potatoes secured may be improved by seed treatment by preventing early seed piece decay. The following table gives the counts made. The counts were made over a period of several weeks so that for this and other reasons a larger percentage were rotted at the time of inspection in some fields than in others.

TABLE 1. Number of Sound Pieces Found Out of 25 Dug.

Grower	Untreated	Calomel	Corrosive sublimate		Yellow oxide of Hg.	Semesan Bel and DuBay Dip	Am- bach Dip
			Hot	Cold			
Livermore	10	18		18	23	22	14
Toan					17	11	
Watson	1	6	10		13		
Britt	5	21	11		17		
Buhl	2	5	3			4	
Irv. Call	1	9	4			4	
Rob. Call	8		12		13		

Similar but more extensive figures have recently been published by Schultz, Gratz, and Bonde.* They conclude that the

*Schultz, E. S., L. O. Gratz, and Reiner Bonde. Effect of seed-potato treatment on yield and Rhizoctonia in Northeastern Maine from 1925 to 1928. Phytopath 20:47-64. 1930.

gains in yield secured from seed treatment may frequently be in considerable part due to keeping the seed pieces from early decay. Unexpectedly, they found that treatments made before the seed were cut were apparently as effective as treatments made after the seed was cut.

A summary of the results of tests made in 1929 is presented in Table 2. One precaution is essential in understanding this table. If two treatments are to be compared, as calomel and corrosive sublimate, the gains of each over the untreated ***should not*** be compared with each other as some of these are in different fields, but the place in the table should be sought where the direct comparison is made between corrosive sublimate and calomel. Here are summarized all the comparisons possible between these two materials where they were used side by side in the same fields.

If the summary table is examined with the precaution mentioned above in mind, it is seen at once that, under the conditions existing this year, significant gains in yield were not obtained by seed treatment. The only figure in the yields-column that is significant or nearly significant is the loss in yield with Ansbacher dip as compared with the untreated and some of the other treatments. Apparently this material caused some injury. It was tried only in four replications of one test at Mr. Livermore's farm. The odds are so low in the other cases as to indicate that the small gains or losses shown are about as likely to have been due to soil and other variations as to the treatments applied.

In the column headed "Gain in percentage of the tubers free from Rhizoctonia" are shown the average differences, all positive, indicating some control from all treatments. The significant gains in control are underlined. When the different treatments are compared with each other not many of the differences are significant. Still there are fair odds that both calomel and yellow oxide of mercury are superior to Semesan Bel in preventing the formation of Rhizoctonia and sclerotia on the tubers. While the presence of small numbers of sclerotia on tubers is of no great commercial importance to growers they are of some use as a direct measure of the control of Rhizoctonia fungus. If the potatoes had been planted under conditions favoring Rhizoctonia injury to sprouts, this injury might reasonably be expected to run parallel in amount with the percentage of tubers showing sclerotia.

The results in the column on scab control seem to be an enigma. Nearly all of the treatments seem to have caused more scab than the untreated though not all of these are significant differences. The cold corrosive sublimate which might reasonably be expected to control scab, judging from past experiments, seems to have failed here nearly as completely as any of the treatments. On the basis of these results it looks

TABLE 2. Summary—Potato Seed Treatment Tests, 1929

Treatments Compared	Gain or loss in yield bushels per acre	Odds this is significant	Gain in percentage of tubers free from Rhizoctonia	Odds	Gain in percentage of tubers free from scab	Odds
Hot corrosive sublimate over untreated	6.63	9:1	7.41	4:1	2.36	8:1
Cold corrosive sublimate over untreated	-5.97	1.7:1	53.23	500:1	-13.33	39:1
All corrosive sublimate over untreated	1.44	None	32.09	450:1	-6.59	12:1
Calomel over untreated	4.88	1.2:1	30.90	220:1	-13.83	600:1
Yellow oxide over untreated	1.83	None	39.06	68:1	-18.53	140:1
Semesan Bel over untreated	1.16	None	27.57	360:1	-8.63	0.7:1
Ansbacher Dip over untreated	-29.35	17:1	52.13	3000:1	-13.22	18:1
Yellow oxide over Semesan Bel	.40	None	27.38	33:1	-10.38	16:1
Calomel over Ansbacher dip	41.40	360:1	8.13	3:1	-15.14	1000:1
Corrosive sublimate over yellow oxide	3.25	.4:1	.93	None	6.50	8:1
Corrosive sublimate over calomel	-6.05	2.4:1	2.07	None	7.99	5:1
Calomel over Semesan Bel	6.58	1.6:1	18.18	38:1	-7.68	48:1
Corrosive sublimate over Semesan Bel	-5.93	1:1	17.92	9.6:1	.42	None
Corrosive sublimate over Ansbacher dip	18.97	3.5:1	18.14	13:1	-7.75	11:1
Yellow oxide over Calomel	-1.95	.25:1	1.96	.7:1	.43	None

as though calomel and yellow oxide were more favorable to scab but in view of the fact that all of the treatments appeared to favor scab, more or less, it is felt that some factor must have been overlooked that had more influence than the treatment.

A summary of field experiments made during the years 1923 to 1929 is given in Table 3. Other materials were used in some of these tests but these have continually been changing so they can not be summarized very well. The gains in yield in this series from seed treatment were variable and the average gain not large. Both calomel and the corrosive sublimate treatment

show barely significant gains over the untreated with no significant difference between them. As regards control of Rhizoctonia both are apparently about equally effective. As regards scab not many figures are included here in addition to those of 1929, so that the enigma is not solved.

TABLE 3. General Summary of Potato Seed Treatment. Tests 1923-1929.

Treatments compared	No Expts.	No. of pairs of plots averaged	Average difference in yield Bu. per acre Gain + Loss —	Odds	Gain in percentage of tubers free from Rhizoctonia	Odds	Gain in percentage of tubers free from scab	Odds
Hot $HgCl_2$* over check	15	46	9.91	120:1	10.07	600:1		
Cold $HgCl_2$ over check	8	32	- .104		28.57	5000:1		
All $HgCl_2$ over check		78	5.8	21:1	18.73	52.000,000:1	-5.56	12:1
Calomel+ over check	12	34	7.51	28:1	26.85	1000:1	-11.24	460:1
Hot and Cold $HgCl_2$ over Calomel	7	38	-4.667	¼:1	2.20	7/10:1	5.84	50:1
Calomel over hot $HgCl_2$	4	20	1.503	None				
Calomel over cold $HgCl_2$			5.55	2:1				

*$HgCl_2$ = Corrosive sublimate.
+First used in 1927.

SUMMARY

It is obvious from the preceding discussion that the results of seed treatment are likely to vary considerably depending on conditions from year to year and it is probable that conditions immediately following planting are most important.

The standard corrosive sublimate treatment has been most extensively tested, and that it is well worth while has been shown beyond a reasonable doubt.

Calomel has been used in a limited number of tests, first in 1927. In this first test it was used at the rate of ten pounds to twelve gallons of water while in later tests it has been used

at the rate of one pound to twelve gallons. In this first test, it gave one of the best stands of potatoes and an average increase in yield over the untreated of about 35 bushels per acre which did not quite equal the increase from hot corrosive sublimate. In 1928, calomel was used in several tests but in only one test was there considerable Rhizoctonia injury and a corresponding increase in yield from seed treatment. The calomel treated plots were the highest yielding in this test. In 1929 more numerous tests were made but no treatments gave significant increases in yields. When all the tests where calomel was used are averaged, it shows a small but significant increase in yield over the untreated and a small but not significant increase over corrosive sublimate. In control of Rhizoctonia, measured by the percentage of tubers showing sclerotia at digging time, calomel showed an average decrease of affected tubers of 31 per cent below the untreated which was not significantly different from results which corrosive sublimate in the same tests. It was superior in this regard to Semesan Bel.

None of the treatments used has shown any significant degree of control of scab in these tests, perhaps because this disease came from soil contamination. The average of scabby potatoes in the calomel plots was greater than in the untreated lots.

Yellow oxide of mercury has been tried for only one year. From laboratory tests it seems superior to calomel as it stays in suspension better and, being slightly more soluble, is considerably more toxic to the Rhizoctonia fungus. Tried only in 1929, it showed no signs of causing injury, was equal to any other treatment in preventing seed piece decay and in the control of Rhizoctonia. It is regarded as promising but needing further trial.

The Michigan Potato Growers' Response to Price

IRVIN HOLMES, Michigan Co-operative Crop Reporting Service, Lansing, Michigan

With the increasing complexity of the problems that face the American farmer today, there has come an appreciation of the importance of economic relationships. Farmers, as well as dealers and students of agricultural problems are beginning to realize that the solution of many of these problems must depend in the first place upon a correct understanding of the inter-reactions of the factors governing production.

It is a matter of general knowledge that price plays an important part in determining the acreage of many of our important cash crops. Recent improvements in statistical methods makes it possible to portray the relation between price and acreage, and to state in general terms the change in acreage which may be expected to follow any given set of price conditions.

One of the most interesting of these studies is that concerning changes in the Michigan potato acreage with regard to the average seasonal price received by producers. In making this analysis, the post-war period, 1920-1929, only has been considered, since the nature of such relationships changes from time to time. This was particularly true during the unsettled period caused by the World War. The prices used are the seasonal averages for each crop year, October to June. In each case they have been deflated to allow for changes in the general price level.

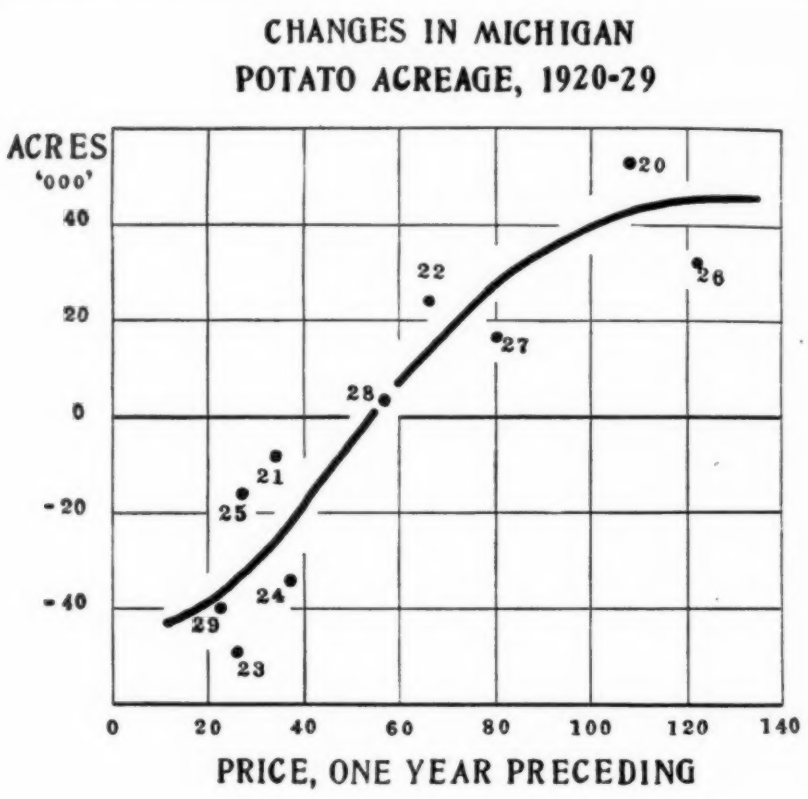
The price received for the preceding crop was found to have the greatest effect upon changes in the Michigan acreage. It appears from the chart pictured herewith that when the price falls below 55c per bushel, Michigan growers tend to restrict their acreage the following year. Slight increases occur following prices ranging from 55c to 80c. Appreciable expansion is generally recorded when the average price is $1.00 or more.

The effect of the price received for the crop two years previous is somewhat different in nature. Michigan growers evidently remember only the extreme variations. When the price falls below 30c or rises above 75c, it apparently is responsible for some change in the acreage. Between these two limits, however, the returns received for the crop two years preceding have but little weight in determining the acreage to be planted.

The combined effect of the prices received for the two preceding crops is stated in the following table:

Price, Two Years Preceding (Cents Per Bushel)	Price, One Year Preceding (Cents Per Bushel)				
	30	50	70	90	110
30	—49	—24	—1	+16	+25
50	—40	—14	+8	+25	+34
70	—24	+2	+24	+41	+50
90	—10	+16	+38	+55	+64
110	+1	+27	+49	+66	+75

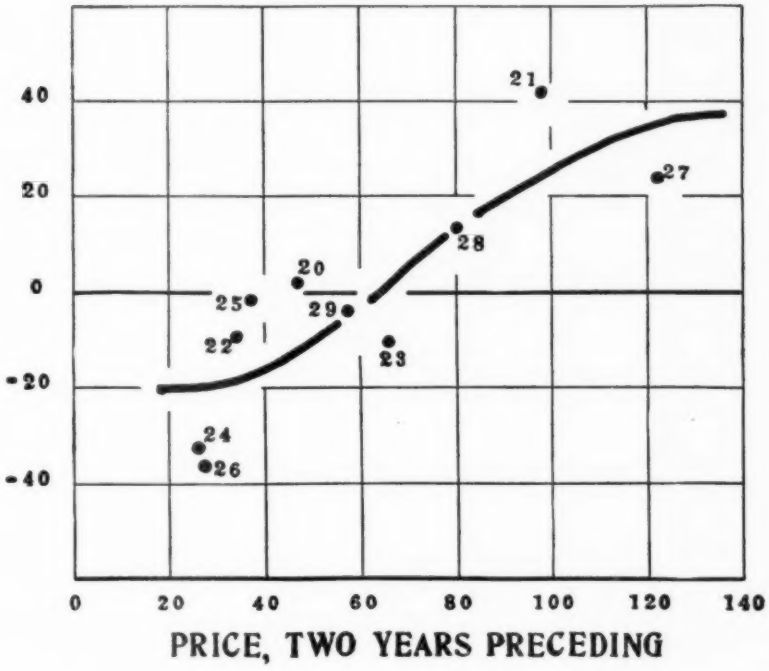
The change in each case is in terms of thousands of acres as



compared with the acreage for the year previous. Thus, with the price of 30c for both years, the expected change from the year before would be a decrease of 49,000 acres.

The significance of this relationship can be better understood when it is stated that 4 per cent of the variation in the Michigan potato acreage during the last ten years can be ascribed to changes in the price received for the two previous crops. Furthermore, the error in the estimates made by the above method amounts, on the average, to only 16,000 acres. This is equivalent to 5 per cent of the average state acreage for the period.

It is interesting to compare the above results with those shown by an analysis of New York state acreage and farm prices. For the years 1920-28, New York potato growers decreased their planting by 20,000 acres whenever the price received for the previous year was $1.00 per bushel. With a price



of $1.20, however, the acreage was usually increased by 10,000 acres. If prices were less than $1.00 or more than $1.20, the acreage change was not so great. If low prices prevailed two years before, the New York farmers tended to remember it, but if high prices had been in order, this fact had little effect upon their plantings.

The relationship of price to the potato acreage is evidently fundamental. The state and nation-wide effect of it is one which every grower should take into consideration before determining the acreage which he intends to plant.

Degeneration of Potatoes in Connecticut

B. A. BROWN, Connecticut Agricultural College, Storrs, Conn.

"Running out" or degeneracy of potatoes has interested and puzzled investigators for nearly one hundred and fifty years. Every conceivable cause for this common phenomenon has been advanced. Some of the outstanding and tenaciously held theories have been: (1) Continued propagation by tubers rather than true seed; (2) Unfavorable environment and necessity for change; (3) Soil; (4) Cultural practices; (5) Fertilization; and (6) Kind of seed, including maturity, size, selected and sprouted. In recent years, the virus diseases, the wide spread dissemination of which was not realized previously, have been found to have a very marked effect on the vigor and yielding capacity of potatoes. In fact, many think these troubles are the only direct cause of degeneracy.

For a long time it has been customary for Connecticut potato growers to purchase seed from regions farther north. In recent years the bulk of the seed was certified. Experience and experiments have justified both practices, but the causes for the poor results with Connecticut grown stock has not been determined.

In 1914, the Agronomy Department of the Connecticut Agricultural College began working on this problem. Thinking that environmental factors were directly responsible for the rapid "running out" of Connecticut grown potatoes, several different cultural methods were tried during the early years in an attempt to maintain vigor and yielding capacity. These methods included early digging and late planting to secure immature tubers; mulching with hay or straw to reduce the soil temperature; selection of high yielding hills; and locating the seed plot in the highlands in the western part of the state. None of these practices resulted in vigorous seed, although immature potatoes and those grown under a mulch were somewhat superior to ordinary stock of the same strain.

During the period 1914 to 1921, the virus diseases, such as mosaic, leaf-roll and spindle tuber were not taken into consideration. When it was recognized that all of the strains worked with during this period were infected with those troubles, they were discarded and another plan adopted. Briefly, the new plan was to grow several originally "healthy" strains in Connecticut for several years, keeping them from becoming infected with mosaic, leaf-roll, spindle tuber, etc., and compare their performance in test plots with stocks of the same strains exposed to the diseases and with new stock from

the original growers in other states. Substrains, which were supposed to be kept healthy, were grown in cheesecloth cages in isolated, rogued fields to prevent infection.

Method of Growing	Number of Substrains Averaged	Virus Diseases (Per cent)	Relative Yields*
A. Irish Cobbler—			
Not isolated or rogued	7	96	49
Isolated, rogued fields	7	17	95
Cheesecloth cages	3	2	109
B. Green Mountain—			
Not isolated or rogued	7	93	30
Isolated, rogued fields	7	36	90
Cheesecloth cages	3	0	82**
C. Russet Rural—			
Not isolated or rogued	4	97	51
Isolated, rogued fields	4	10	96
Cheesecloth cages	3	0	110

*The yields from certified seed of original growers taken as 100.

**Due to limited amount of seed available, very small seed pieces were planted.

It is very evident that keeping the disease counts low was responsible for maintaining the yielding capacity of all strains and varieties. This corroborates most of the more recent data obtained in other regions. However, due to the difficulties and uncertainties involved in keeping potatoes healthy, the established facts may have no practical value to potato growers in southern New England.

For seven years—1922 to 1928—the above plan was followed. One strain of Russet Rurals, three of Green Mountains, and three of Irish Cobblers were included in the experiments. In most instances, two or three importations of ***each*** strain were grown under the various conditions.

It became apparent very soon that the stock grown in isolated, rogued fields or cheesecloth cages was far superior to ordinary Connecticut seed and yielded practically as well as the potatoes obtained each year from the original growers. It was possible to keep the isolated and caged strains reasonably free of the virus diseases, particularly the latter. As usual, the ordinary Connecticut strains became badly infected with the degenerative diseases. Usually, nearly one hundred per cent of the plants were infected by the fifth year, although in one instance, all plants showed leaf roll symptoms after only

one year in Connecticut. As a rule, Green Mountains were more susceptible to infection than either the Russets or Cobblers, but not enough difference existed between the three varieties to warrant a choice on this factor alone.

In every case it was found that vigor and yields were very closely correlated with the amounts and severity of infection with the virus troubles. The results for all substrains given above clearly brings out this point. The data for all substrains in their fifth year in Connecticut are averaged for this summary.

Editorial and Membership Committees of the Potato Association of America 1930

EDITORIAL COMMITTEE

H. C. Moore, Chairman, East Lansing, Michigan.
E. V. Hardenburg, Cornell University, Ithaca, N. Y.
J. R. Tucker, Central Experimental Farm, Ottawa, Canada.
E. A. Stokdyk, University of California, Berkeley, California.
F. G. Robb, Bureau of Agricultural Economics, Washington, D. C.
C. F. Clark, Bureau of Plant Industry, Washington, D. C.
C. W. Waid, State Department of Agriculture, Columbus, Ohio.
B. E. Brown, Bureau of Chemistry and Soils, Washington, D. C.
Freeman Weiss, Office Plant Disease Investigations, U. S. D. A., Washington, D. C.

MEMBERSHIP COMMITTEE

F. M. Harrington, Chairman, Bozeman, Montana.
L. D. Sweet, 1641 Stout St., Denver, Colorado.
Daniel Dean, Nichols, Tioga County, N. Y.
K. W. Lauer, State Department of Agricultural, Harrisburg, Pennsylvania.
J. R. Livermore, Cornell University, Ithaca, N. Y.
E. L. Newdick, State Department of Agriculture, Augusta, Maine.

Notes

CANADA

The New Brunswick growers of certified seed potatoes have had, in 1929, the best year since the inception of the certification service. A few weeks will bring to close a season of record shipments of certified seed potatoes, as over 200 carloads of all varieties were shipped to various markets. The growers in the State of Maine purchased 150 carloads of Green Mountains, twice the amount of any previous year, which speaks well for the foundation stock grown in New Brunswick. Prices to the growers were good throughout the season, ranging from $3.75 to $4.25 per barrel, 165 pounds.

Indications point to an increase in acreage to be entered for certification in 1930 particularly of the Bliss Triumph variety. Many growers in the province have purchased new seed for planting this season, and the returns received for last year's crop will naturally cause an increase. Planting will begin earlier this year, possibly by the second week in May, should the present weather conditions remain the same.

—C. H. GODWIN.

MAINE

The Aroostook Potato Special

On Thursday morning, March 27th, a train consisting of seven cars, six Pullman and one baggage, left Presque Isle, Maine, for a tour of the Southern States. This trip was scheduled to take sixteen and one-half days and to cover six thousand twenty-four miles. One hundred and forty-nine men made up this party, mostly Aroostook County farmers. It is true that there were six State employees, three doctors, three lawyers, four bankers and a few members of other professions.

Mr. Ray D. Hews, one of the younger farmers, had thought for several months that such a trip would be a good thing for the county. Acting as Chairman for the County Committee and with the help of a few others, Mr. Hews made the detail plans and saw the trip through to its final conclusion.

The object of the trip was not to take an order book and try to make sales but rather to meet those people with whom

the different growers had been doing business and to exchange ideas with them in an attempt to learn the market requirements so that the Aroostook County growers might better meet them. As originally planned this was a seed potato tour, although the table stock factor was not lost sight of. Practically all the states south of New York were visited and it is not unfair to say that many of the men came back sadder but wiser than before, realizing that competition in the seed game is keener than ever.

The reception accorded this group by the Chambers of Commerce, governors and state officials was spontaneous. This group was even accorded the honor of having their picture taken with President Hoover. Invitations, too numerous to mention, were received and accepted. Before leaving, a publicity director had been busy making contacts. Each individual had been asked to notify his customers in the towns to be visited. By these means it was possible to get a large number of people to visit the train and inspect the baggage car which was arranged with an exhibit of fine seed potatoes as well as carrying specially prepared advertising matter.

The famous Wharton-Eagle Lake section of Texas was visited, also the Sugarland section. The equally well-known Hastings section of Florida, Savannah, Georgia; Charleston, South Carolina; Norfolk, Virginia, all centers of a large seed business from Maine, were each given a full day for the party to meet friends and study conditions.

To summarize, it is impossible to measure the results obtained by such a trip. This much can be said. A group of farmers were willing to put $40,000.00 of their own money into a project that they might better do the job which they had chosen for their life work. Maine ships more potatoes than any other state in the United States. The growers are alive and they intend to be able to meet any competition that may be forced upon them. If anyone has better ideas about this great industry the Aroostook men want to know. They have returned wiser in many ways and they view the future with courage, believing that their county is just a little bit better than any other and that their seed potatoes will be kept a factor in the trade for years to come.

E. L. NEWDICK.

Review of Recent Literature

EDWARDS, E. E. The Control of a Serious Potato Trouble. Jour. Min. Ag. 36: 234-242.

Potato growers in Lincolnshire, Yorkshire and Lancashire have for some years past experienced serious losses from an obscure complaint variously known as "Potato sickness," "Potato eelworm" and "Potato dab." This trouble is most serious in Lincolnshire in first and second early varieties. Studies looking toward the control of this trouble were undertaken in 1928 by the Kirton Agricultural Institute. The variety used was Eclipse. The experimental area was divided into 12 plots of 1/20th acre each. The following five chemicals were applied to the respective plots:

Drained creosote salts at the rate of 8½ cwt. (925 lbs.) per acre.

Calcium cyanide at the rate of 10 cwt. (1120 lbs.) per acre.

Quicklime at the rate of 30 cwt. (3360 lbs.) per acre.

Calcium cyanamide at the rate of 5½ cwt. (616 lbs.) per acre.

Carbon disulphide at the rate of 30 gals. per acre.

All substances were applied 12 days before planting the potatoes. The chemical salts were broadcasted and ploughed in immediately after the application to a depth of about 6 inches. The liquid carbon disulphide was applied by means of a pneumatic hand sprayer which distributed the fluid in a fine misty spray over the bottom of the furrow in front of the plough. The quicklime was evenly spread and harrowed well into the soil. The plots were planted April 27. Observations at the end of June showed that the plants in the creosote salts plot were vigorous and of a healthy color. The untreated plots contained many unhealthy plants with withered leaves and stunted growth. The carbon disulphide plot plants were nearly as good as those on the creosote salts plot while those growing on the calcium cyanamide and calcium cyanide plots were not far behind. The quicklime plot showed but little improvement. By the end of July the differences were far more striking and it was quite apparent that there would be material differences in yield. The plots were harvested August 15 and weights made of the produce from each. Recognizing the relation between cost of treatment and value of return therefor the author has furnished this information and has presented these data in tabular form.

The untreated plots cost nothing for treatment and produced 6.57 tons potatoes. The creosote salts treatment cost approximately $19.44 per acre and produced 11.02 tons potatoes or a net profit of about $88.70 per acre. The carbon disulphide treat-

ment cost about $74.12 per acre, produced 9.62 tons per acre and showed no profit. The calcium cyanide treatment cost about $174.96 per acre, produced 9.125 tons potatoes per acre and showed a net acre loss of $111.78. The calcium cyanamide treatment cost about $21.87 per acre, produced 8.6 tons potatoes per acre and showed a net profit of $26.73 per acre. The quicklime treatment cost about $19.44 per acre and showed a net profit of about $4.86 per acre. As a result of the season's experience the author recommends using 8 tons of drained creosote salts per acre.

—W. STUART.

ANONYMOUS. Surplus Potatoes: 1. The Use of Potatoes and Oats as Feedingstuffs. Scottish Jour. Agr. 13:30-36, Jan. 1930.

Experimental studies to determine the feeding value of potatoes for pigs and cattle were conducted at the Dowthie Experimental Stock Farm, Rowett Institute, Aberdeen. As a result of these studies the following conclusions are given. Weight for weight potatoes have from 2 to 2¼ times the feeding value of swedes and about a fourth of the feeding value of cereals.

For cattle, potatoes can be fully utilized raw, but for pigs the percentage utilization is increased by cooking. Oats on account of their high percentage of fibre have a rather lower feeding value than the average of other cereals. The large percentage of fibre limits the amounts which can profitably be used for the feeding of young pigs. For young pigs crushed oats can be used up to one-third of the ration without harmful effects. The results of tests given above show that for young pigs, rations containing a high proportion of oats and boiled potatoes give as good gains and are more economical than rations with certain other commonly used feedingstuffs.

For milk cows potatoes can be used up to 12 lbs. per head per day with beneficial results.

Cost of rations are given showing that the substitution of potatoes and oats for commonly used cakes and meals, is, at present prices, an economical procedure.

It is considered that at present prices oats for feeding purposes are worth about $35.23 per ton and potatoes for pigs about $9.72 per ton, and for cows about $8.50 per ton.

—W. STUART.